Yorkton Area Aquifers

Source Water Protection Plan

August 2006

Saskatchewan Watershed Authority

Yorkton Area Aquifers Advisory Committee

2008-03221/

Table of Contents

1. Commitment from Participants 1
2. Executive Summary 2
3. Introduction to Source Water Protection 3
4. Long-Term Mission/Goal Statement 4
5. Interests and Issues 5
6. Planning Objectives, Recommendations and Key Actions 6
7. Appendices 17
   - Appendix A
     - Participants in the Planning Process 18
   - Appendix B
     - Aquifer Advisory Committee Terms of Reference 19
   - Appendix C
     - Yorkton Area Aquifers Source Water Protection Plan (on CD or at www.swa.ca)
   - Appendix D
     - Groundwater Resources in the Yorkton Aquifer Management Plan Area Final Report (on CD)
8. Glossary 23
9. Reference List 27

List of Figures

- Figure 1.
  - Yorkton Aquifers Planning Area Map 4
- Figure 2.
  - Aquifer Vulnerability Map 9

1. Commitment from Participants

Dear Yorkton and Area Residents:

In 2002, the Saskatchewan Watershed Authority began working with local municipalities and interest groups to create an Advisory Committee in the Yorkton area to undertake an important planning initiative. The goal of the initiative was to identify the threats and opportunities around source water protection with a focus on groundwater in the Yorkton area, and provide an action plan to address these threats.

The result of the planning process is this Yorkton Area Aquifers Source Water Protection Plan. It contains a series of objectives, recommendations and key actions intended to protect both surface and groundwater supplies. Key actions were designed to provide a clear direction as to what needs to be done, and by whom. Every individual resident, organization and agency within the watershed has a responsibility to take measures to protect source waters. The result of these actions will ensure clean water supplies for the future.

Protecting the aquifers beneath Yorkton and the surrounding area is something that requires the cooperation of everyone, especially those who represent local residents and interest groups. The dedication and efforts of the Yorkton Area Aquifers Advisory Committee, along with the assistance of a committee of technical experts, has made this plan an important step in maintaining healthy water supplies for everyone in the Yorkton area.

Sincerely,

Brad Ashdown and Rob Kirkness
Planning Team

2. Executive Summary

In the area surrounding the city of Yorkton, as well as within the city itself, groundwater is virtually the only reliable supply of source water for drinking, as well as for agriculture, industry and municipal supplies. For this reason, source water protection planning in this area is focused on the local aquifers, and on the measures needed to manage potential threats to the quantity and quality of groundwater.

In order to develop the Yorkton Area Aquifers Source Water Protection Plan, an Aquifer Advisory Committee was formed to provide local input on issues related to source water protection, and to help decide what would be the most appropriate measures for implementation. A Technical Committee comprised of experts from various government departments was also formed to collect information and provide management options for the Aquifer Advisory Committee to consider. To facilitate the process, a Planning Team was assigned by the Saskatchewan Watershed Authority to carry out administrative duties and provide technical assistance.

Key Aquifer Facts

- The planning area includes four main aquifers: the Collacott, Leech, Logan and Sturdee aquifers.
- A network of 130 observation wells has been developed to track water levels and water quality in each aquifer.
- Approximately 17,650 people live in the planning area.
- Approximately 5,000 dam^3 per year are withdrawn from wells in 20 townships.

After an exhaustive list of source water protection issues was developed, a risk analysis was conducted to rate the issues in terms of the potential risk each presented to the groundwater in the Yorkton area. The results of this process indicate that there do not appear to be any extreme threats requiring immediate protection measures. Rather, there are several moderate issues regarding groundwater in the Yorkton area that should be addressed.

Another tool that was critical in developing this source water protection plan was the Aquifer Vulnerability Index. This is an indicator of how easily nutrients or contaminants can move downward into the aquifers in the plan area based on geology and soil conditions. For more information about the methodology used to determine aquifer vulnerability in the Yorkton area, as well as detailed information about the characteristics of the major aquifers involved in the plan, refer to the report entitled *Groundwater Resources in the Yorkton Aquifer Management Plan Area Final Report* (Maathuis and Simpson, 2006). This report can be found in Appendix D on the CD attached to this document.

Once the information was compiled, various management options were presented to the Aquifer Advisory Committee for their consideration. The Aquifer Advisory Committee then selected the appropriate actions to be included in the source water protection plan. This document contains the recommendations that were adopted by the Aquifer Advisory Committee for inclusion in this Yorkton Area Aquifers Source Water Protection Plan.

3. Introduction to Source Water Protection

Safe drinking water is essential for human life, and ensuring a safe drinking water supply is an integral component in the protection of public health. High quality water is also important in maintaining the productivity of industry, sustaining commerce, and it is vital for crop production and ranching.

The quality of drinking water, the condition of the systems that produce it and the protection of source waters are some of the most important environmental and public health issues in Saskatchewan at the present time. Ensuring the safety of our drinking water is a shared responsibility, and one which cannot be taken for granted. The importance of protecting drinking water sources and ensuring sound treatment for potable water was made especially clear to Canadians after the tragedies in Walkerton, Ontario and North Battleford, Saskatchewan.

As part of a comprehensive action plan to minimize the risks associated with drinking water and to protect the health of Saskatchewan residents, the Government of Saskatchewan developed the *Safe Drinking Water Strategy*. The *Safe Drinking Water Strategy* is a comprehensive action plan designed to deal with the risks that affect drinking water and impact the health of Saskatchewan residents.

As a means to attain the future vision for drinking water laid out in the *Safe Drinking Water Strategy*, the Government of Saskatchewan adopted the following principles:

- **human health** is the primary concern;
- **preventing risks** to drinking water is a high priority;
- **openness and clear communication** will ensure everyone understands and carries out their responsibilities;
- **realistic pricing** acknowledges the value of safe drinking water;
- **accurate and timely information** about water problems and solutions is essential for waterworks owners, operators, regulators and users; and
- **all levels of government and citizens must work together** to develop and implement water management solutions.

The *Safe Drinking Water Strategy* was first announced in April 2002 and since that time has made significant progress in advancing drinking water and source water protection in Saskatchewan.

Key actions and regulatory improvements are planned for 2006 that will continue the progress that has been made in water management in Saskatchewan. Several departments and agencies are involved in implementing the Strategy, including Saskatchewan Environment, Saskatchewan Health, Regional Health Authorities, the Saskatchewan Watershed Authority, SaskWater, Saskatchewan Government Relations, and Saskatchewan Agriculture and Food. These departments and agencies deliver Saskatchewan's regulatory programs and advisory services for drinking water and wastewater management, source water protection, watershed planning, water allocation, and other activities that may affect the quality of water.

Key partners outside of the provincial government include the Government of Canada through the Canada-Saskatchewan Infrastructure Program and the recently announced Canada-Saskatchewan Municipal Rural Infrastructure Fund, the Saskatchewan Urban Municipalities Association, the

Saskatchewan Association of Rural Municipalities, the Saskatchewan Water and Wastewater Association, and the Operator Certification Board.

The Saskatchewan Watershed Authority

In October 2002, in order to better coordinate efforts to protect water sources across Saskatchewan, the watershed management responsibilities of SaskWater, Saskatchewan Environment and the Saskatchewan Wetland Conservation Corporation were combined to form a new Crown corporation, the Saskatchewan Watershed Authority. The corporation is responsible for managing and protecting the quality and quantity of source waters, which includes development of source water protection plans with the involvement of local stakeholders, interest groups and municipalities.

4. Long-Term Mission/Goal Statement

"Citizens of Yorkton and surrounding communities working together to protect the area aquifers."

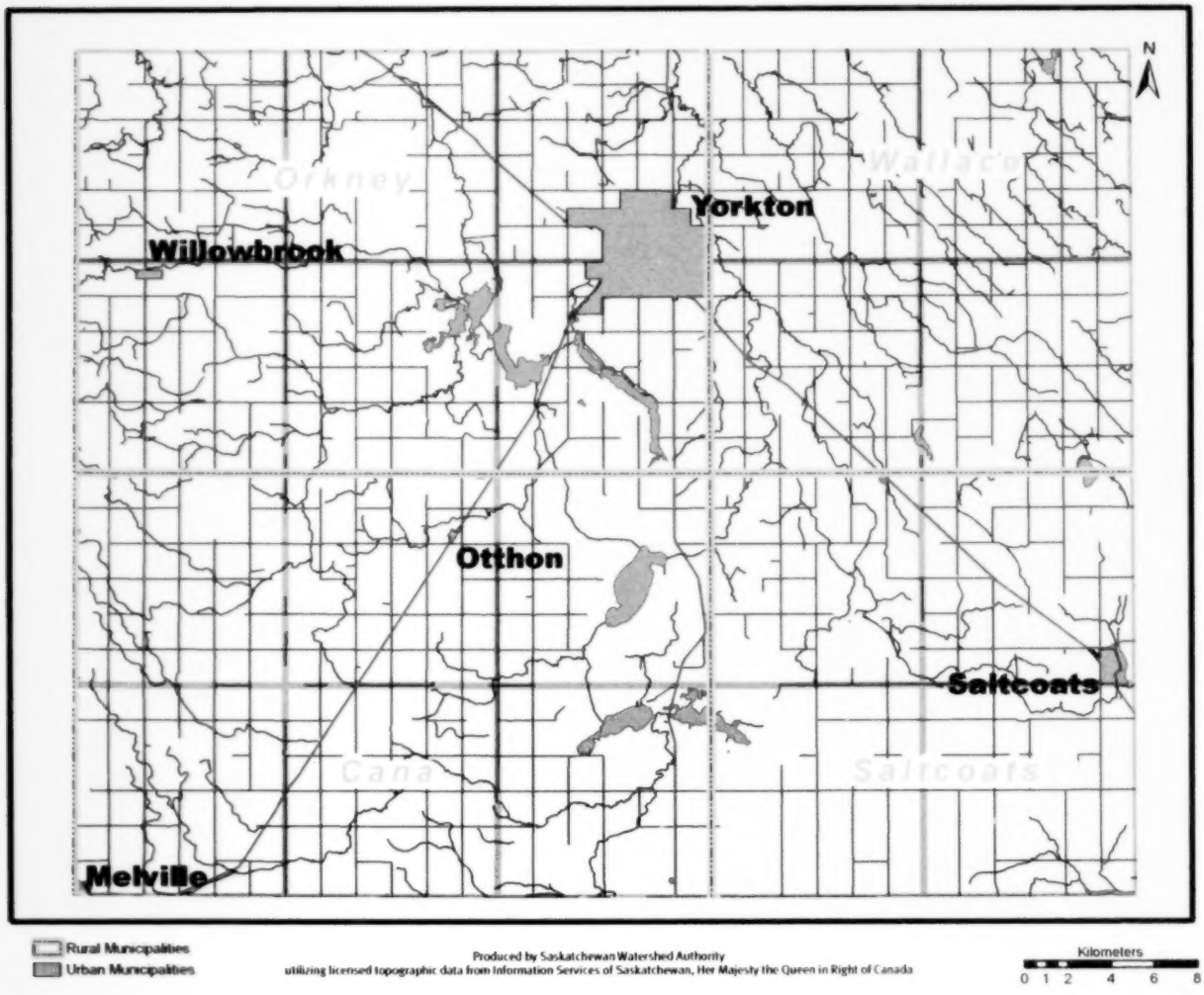


Figure 1: Yorkton Aquifers Planning Area Map

5. Interests and Issues

The following issues were considered as a starting point for the identification of potential threats to water quality and/or quantity within the aquifers in the Yorkton area:

- Intensive Livestock Operations
- Garbage dumps and landfill sites
- Chemical storage sites
- Fuel storage sites
- Gravel pit sites
- Existing water wells
- Abandoned water wells
- Dangerous goods transportation and spills
- Non-point agricultural sources of fertilizers and pesticides
- Industrial sites
- Urban pesticide, herbicide and fertilizer applications
- Domestic sewage disposal
- Loss of natural vegetation cover, wetlands, and riparian zones
- Aquifer infiltration from another aquifer of inferior water quality

These issues were then categorized into relative levels of potential risk to water quality, based on the intensity and extent of the negative effects that the issue might pose and the probability or frequency of that issue occurring. The issues that were classified as having the highest risk ratings were:

Issue	***Rating***
Agriculture (cropping)	Moderate
Livestock (all aspects)	Moderate
Domestic sewage	Low
Spills	Low
Chemical Container sites	Low
Industrial Sites	Low
Urban Stormwater	Very Low
Landfill Sites	Very Low

The purpose of rating the issues in terms of risk was to determine which activities are most important to focus on in the context of a source water protection plan. The next step was for the Technical Committee to examine these general issues and decide what specific activities may pose a risk to the quality of groundwater in the area. At that point it was determined that there was a difference between activities that pose a threat to groundwater and existing conditions that constitute a risk, such as improperly abandoned wells.

The task of managing the risks to water quality then becomes a combination of modifying the activities that can lead to longer-term negative impacts and eliminating the human-caused conditions that increase the vulnerability of aquifers to contamination.

The following objectives state the ideal outcomes of a series of recommendations, and include more specific key actions that support the implementation of a protection plan for the aquifers in the Yorkton area.

6. Planning Objectives, Recommendations and Key Actions

Objective 1:

Eliminate direct patnways to aquifers.

In Saskatchewan, where many aquifers are protected beneath several meters of glacial till, there is a reduced risk of contamination from the surface. However, the removal of this protective layer, either from an excavation or a well, can create a pathway where contaminants can be released directly into the groundwater. The best way to remove this possibility is to eliminate these pathways, such as by ensuring that proper safeguards are in place around wells and excavations.

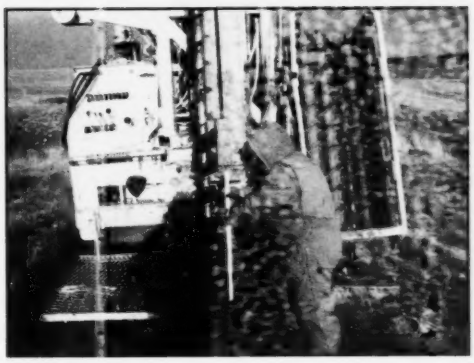
Well Maintenance and Abandonment

It is important to properly decommission water wells in order to prevent contaminants from entering an aquifer, and also to eliminate any physical hazards to humans and animals. The purpose of water well decommissioning is to remove the opportunity for vertical flow, either from the surface or between aquifers. The soil layers above an aquifer act as a physical barrier and a natural filtration system by removing potential contaminants through the absorption and decomposition of organic and inorganic contaminants. But when a water well is improperly sealed, it becomes a direct route for surficial contamination to enter groundwater. After the groundwater has been contaminated, natural groundwater gradients will transport any contaminants away from the source. Possible point sources of contamination include landfills, effluent lagoons, septic fields, petroleum storage facilities, intensive livestock operations, etc. Non-point contaminant sources include agricultural fertilizers, manure spreading, pesticides and herbicides, highway salts, etc. Once contamination has occurred, groundwater remediation usually is not economically feasible and, in some cases, is nearly impossible.

Regulation of water well abandonment is administered by the Saskatchewan Watershed Authority pursuant to *The Saskatchewan Watershed Authority Act, 2005*. Although the abandonment of water wells is regulated by the Saskatchewan Watershed Authority, the primary responsibility for abandoning water wells rests upon the well owner. The work of decommissioning the well should be completed by a suitably qualified water well contractor.

Recommendation

1.1 The first step is to develop a complete inventory of all existing wells in the study area. Each well will be categorized as either active or abandoned. This information could be collected from a variety of sources, and will be used to assess the level of programming required to either correctly decommission any unused wells or to ensure that those wells currently being used are properly sealed. The condition of each well would also need to be evaluated by a site visit. Once the inventory has been accumulated and well assessments are complete, it will then be possible to develop program strategies.



Key Action: Complete a well inventory and site visits.

Completion date	Responsibility
2006-ongoing	**Saskatchewan Watershed Authority** **Yorkton Area Aquifers Committee** **Saskatchewan Environment** **Sunrise Regional Health Authority**

Key Action: Develop both well head integrity and abandoned well decommissioning programs.

Completion date	Responsibility
2007	**Saskatchewan Watershed Authority**

Recommendation

1.2 The Government of Saskatchewan needs to develop standards/guidelines for the geothermal heating industry.

The consensus among both the Advisory and Technical Committees was that, as energy costs rise, geothermal heating will increase in popularity because of the potential for reducing home heating costs. However, the installation of geothermal heating systems will result in increased unregulated well drilling activity. Therefore, the Government of Saskatchewan must review the potential impacts of this industry to ensure the protection of aquifer ground water sources.

Key Action: Develop standards for in-ground components and installation processes for commercial installers to follow.

Completion date	Responsibility
2008	**Saskatchewan Watershed Authority** **Saskatchewan Environment** **Saskatchewan Ground Water Association Inc.**

Objective 2:

Protect sensitive areas of the aquifers from surface contamination.

Where aquifers are vulnerable to contamination from surface activities, those activities that pose a significant risk of causing contamination must be carefully managed.

Land Use

Development has the potential to generate excessive and undesirable environmental disruption and pollution. While the Saskatchewan Watershed Authority, Saskatchewan Environment and Saskatchewan Health each work to ensure a good supply of safe, clean drinking water through Saskatchewan's *Safe Drinking Water Strategy,* municipal governments should be aware of and accept their environmental planning responsibilities within the framework of *The Planning and Development Act, 1983* and other statutes.

Long-Term Hydrologic Impacts

Changes in land use can affect the volume of water available for groundwater recharge, carry pollutants to areas of groundwater recharge and result in high-risk activities occurring over vulnerable areas. For example, the water available for recharging aquifers underlying cities and towns can be affected by urban development. Urbanization can lead to an increase in the amount of impervious surfaces, which may result in increases in surface runoff. This, in turn, can contribute to downstream flooding and a net loss in groundwater recharge, which can affect residential and municipal water supplies. Minimizing the disturbance on an urbanizing watershed is one way of ensuring continued water supply (Ehle et al 2002). As each land use has a different level of impact, careful physical planning can minimize these impacts. Although the impacts of urban sprawl on groundwater recharge and surface water quantity and quality can be important, it is challenging to estimate the potential hydrologic impacts of land use in a given area.

Land use in rural areas is mainly associated with agriculture. Certain agricultural activities occurring where aquifer vulnerability is high are of particular concern. Agricultural activities can accelerate the movement of nutrients to ground and surface water, particularly from overuse of fertilizers and inappropriate manure management practices (CCME 2002). This means that, for at least the sensitive areas of the aquifers in the vicinity of Yorkton, municipal zoning should address both urban development and rural land uses that could potentially impact groundwater quality.

Recommendation

2.1 Identify areas where aquifers are most vulnerable to contamination from land use activities.

Key Action: Prepare map products that identify areas where aquifers are vulnerable to contamination from land use.

Completion date	Responsibility
2006	**Saskatchewan Research Council** **Saskatchewan Watershed Authority** **City of Yorkton**

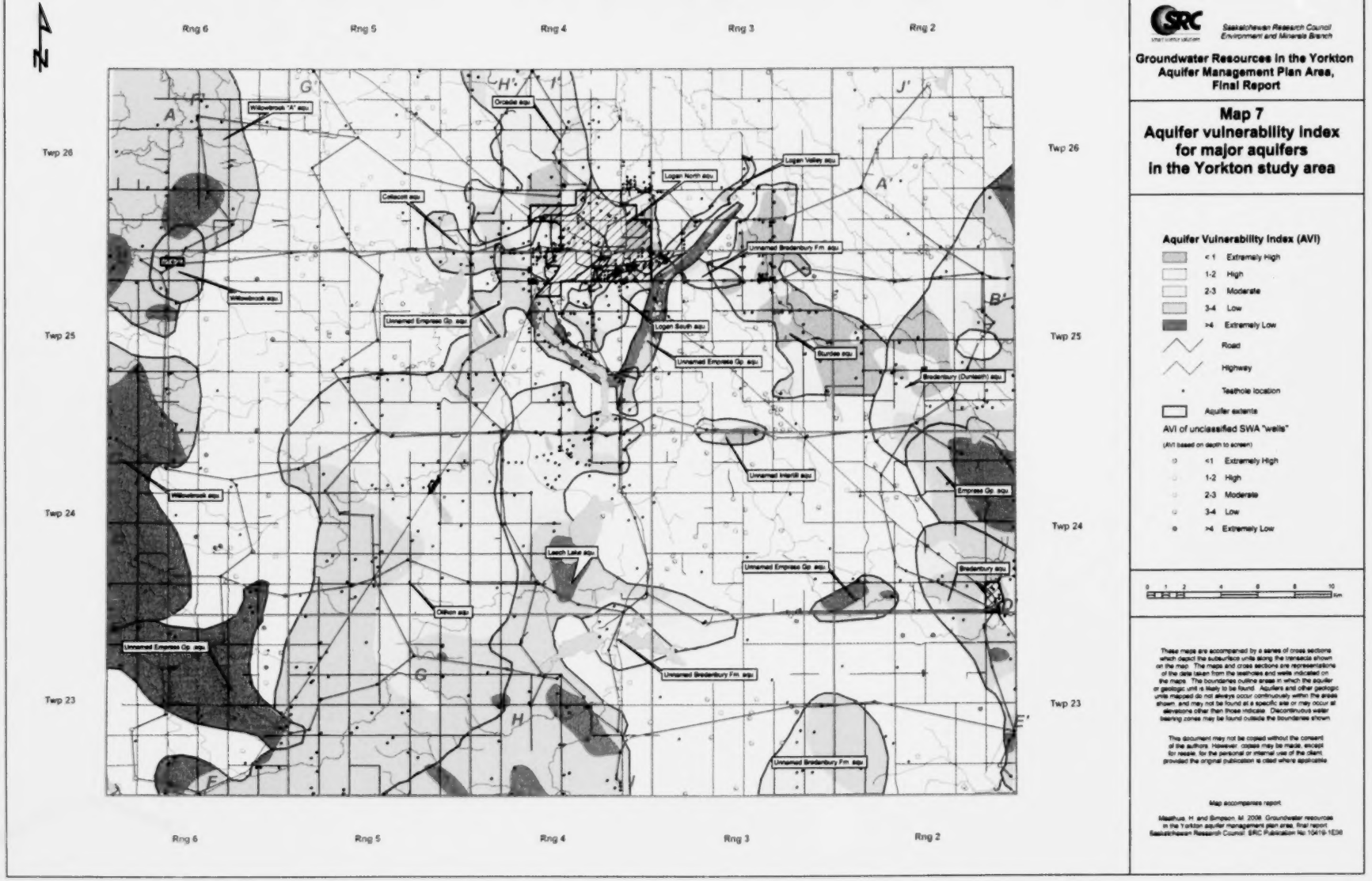

Rng 6
Rng 5
Rng 4
Rng 3
Rng 2
Twp 26
Twp 25
Twp 24
Twp 23
Wildwillow "A" aqu.
Oriole aqu.
Logan Valley aqu.
Logan North aqu.
Collacott aqu.
Unnamed Bredenbury Fm. aqu.
Willowbrook aqu.
Unnamed Empress Gp. aqu.
Logan South aqu.
Burdee aqu.
Bredenbury (Dunleath) aqu.
Unnamed Interhill aqu.
Empress Gp. aqu.
Leech Lake aqu.
Bredenbury aqu.
Dillon aqu.
Unnamed Bredenbury Fm. aqu.
Saskatchewan Research Council
Environment and Minerals Branch
Groundwater Resources in the Yorkton Aquifer Management Plan Area, Final Report
Map 7
Aquifer vulnerability index for major aquifers in the Yorkton study area
Aquifer Vulnerability Index (AVI)
< 1 Extremely High
1-2 High
2-3 Moderate
3-4 Low
>4 Extremely Low
Road
Highway
Testhole location
Aquifer extents
AVI of unclassified SWA "wells"
(AVI based on depth to screen)
<1 Extremely High
1-2 High
2-3 Moderate
3-4 Low
>4 Extremely Low
0 1 2 4 6 8 10 Km
These maps are accompanied by a series of cross sections which depict the subsurface units along the transects shown on the map. The maps and cross sections are representations of the data taken from the testholes and wells indicated on the maps. The boundaries outline areas in which the aquifer or geologic unit is likely to be found. Aquifers and other geologic units mapped do not always occur continuously within the areas shown, and may not be found at a specific site or may occur at elevations other than those indicate. Discontinuous water bearing zones may be found outside the boundaries shown.
This document may not be copied without the consent of the authors. However, copies may be made, except for resale, for the personal or internal use of the client, provided the original publication is cited where applicable.
Map accompanies report
Meyhus, H. and Simpson, M. 2008. Groundwater resources in the Yorkton aquifer management plan area, final report. Saskatchewan Research Council. SRC Publication No. 10419-1E08

Figure 2: Aquifer Vulnerability Map

Recommendation

2.2 Rural Municipalities and the City of Yorkton should adopt consistent zoning and bylaws that will ensure vulnerable areas of the aquifers are zoned in a manner that minimizes the potential for contamination.

Identifying all of the types of rural, urban and industrial land use activities that pose potential threats to aquifers is beyond the scope of this plan. Therefore, the alternative is to use a precautionary approach based on expertise from those in the field of hydrogeology and strategies developed in other jurisdictions. Zoning districts that correspond to aquifer sensitivity can be used to regulate land use activities.

Key Action: Develop a zoning district schedule.

Completion date	Responsibility
2008	**Rural Municipalities** **City of Yorkton**

These zoning bylaws will not apply to existing activities, but will only address new developments and expansions. A permit review process would be made available to developers and new agricultural operations that wish to challenge a zoning bylaw on the basis of the following conditions:

- the developer has an opportunity to conduct their own site-specific analysis and address potential contamination risks by adopting site-specific measures of protection; and

- the developer has an opportunity to conduct their own nutrient or bacteriological sampling in the sensitive area(s) to evaluate existing soil conditions.

Recommendation

2.3 Delivery of the Saskatchewan Watershed Authority's Rural Water Quality Advisory Program should continue, along with additional efforts to raise awareness of the importance of regularly testing privately owned wells. The province's public waterworks, which serve the majority of urban residents, are regulated by Saskatchewan Environment. These regulations require that the owners and operators of the systems regularly test for a variety of constituents in the treated drinking water and make the results available to any interested parties. The rural population also deserves to know something about the state of their water sources, since many rural well owners use untreated water.

Key Action: Continue with the Saskatchewan Watershed Authority's Rural Water Quality Advisory Program, and add education and awareness components.

Completion date	Responsibility
Ongoing	**Saskatchewan Watershed Authority**

Recommendation

2.4 Promote soil testing in sensitive areas.

Experts suggest that managing inputs of nitrogen to match crop requirements is a good preventative measure to ensure excess nutrients do not affect groundwater quality. Proper fertilizer application rates are especially important in minimizing the downward movement of nitrates in sensitive areas.

Key Action: Develop a soil sampling strategy that will promote cost-sharing of soil analysis with producers that take appropriate samples within the sensitive areas.

Completion date	Responsibility
2007 – ongoing	**Saskatchewan Agriculture and Food** **Yorkton Area Aquifers Committee**

Key Action: Determine a sampling frequency for the soil sampling strategy so that soil conditions can be monitored and accurately matched to crop requirements.

Completion date	Responsibility
2007 – ongoing	**Saskatchewan Agriculture and Food** **Yorkton Area Aquifers Committee**

Key Action: Increase the capacity to conduct soil analysis where the testing facility does not have an interest in the sale of agricultural products.

Completion date	Responsibility
2007 – ongoing	**Saskatchewan Agriculture and Food** **Yorkton Area Aquifers Committee**

Recommendation

2.5 Domestic wastewater systems must be designed to prevent long-term nutrient loading of shallow, unconfined aquifers.

The current *Saskatchewan Plumbing and Drainage Regulations, 1996*, which regulate domestic wastewater systems, are under review. There is a need to develop new, science-based wastewater disposal guidelines for private systems.

Alternative methods of disposal other than septic mounds or absorption fields may need to be considered where there is a risk of untreated sewage coming in contact with saturated portions of an aquifer.

A possible preventative measure could be to increase the "setback distance" between a domestic sewage discharge point and the water table to a distance greater than the 1.5 metres currently required by the *Saskatchewan Plumbing and Drainage Regulations, 1996*.

Key Action: Require domestic sewage disposal systems through municipal zoning that are designed to reduce the risk of groundwater contamination in sensitive areas.

Completion date	Responsibility
2008	**Rural Municipalities** **Saskatchewan Watershed Authority**

Recommendation

2.6 Reduce the tolerances for reporting of hazardous substance spills, both in terms of the time that is allowed to report the incident and the volume of the spill, in sensitive areas.

Key Action: Provide a list of spill response contacts to all rural residents, and conduct an awareness campaign about spill regulations and the harmful effects that certain commonly used substances can have on groundwater.

Completion date	Responsibility
2008	**Saskatchewan Environment** **Rural Municipalities** **Yorkton Area Aquifers Committee**

Key Action: The Yorkton Area Aquifers Committee will participate in the regulatory review for the proposed "Hazardous Materials Regulations" to ensure aquifer protection measures are included in the new regulations.

Completion date	Responsibility
2008	**Saskatchewan Environment** **Rural Municipalities** **Yorkton Area Aquifers Committee**

Recommendation

2.7 Ensure industrial activities are compatible with sensitive areas.

There may be industrial sites which are either currently in use or abandoned that constitute a threat to groundwater quality due to the fact that they are located where aquifer vulnerability is high. These sites are often talked about in the community without any action being taken to prevent contamination. These sites should be reported to Saskatchewan Environment so that they may be investigated and evaluated in terms of what risk they pose to the environment.

Key Action: Investigate any sites within sensitive areas that are known to be or believed to be potentially contaminated and, if needed, ensure that the site is properly decommissioned in the future.

Completion date	Responsibility
Ongoing	**Saskatchewan Environment**

Recommendation

2.8 Prevent contamination from activities in and around gravel pits.

A large part of this threat pertains to what may happen in a gravel pit when it is not properly reclaimed or when access is unrestricted. These sites are often looked upon as a convenient place to dispose of waste. Considering that soil and clay is usually stripped away to expose gravel for extraction, this can provide areas where an aquifer can be exposed almost directly to whatever possible contaminants may accumulate in the pit.

Key Action: Develop a gravel pit management strategy.

Completion date	Responsibility
2007	**Rural Municipalities** **Saskatchewan Government Relations**

Recommendation

2.9 Provide cash incentives in addition to the Canada-Saskatchewan Farm Stewardship Program to encourage producers to implement Environmental Farm Plans for agricultural land in sensitive zones.

These incentives would promote the implementation of voluntary Beneficial Management Practices for both crop and livestock producers such as maintaining appropriate stocking densities, determining limits for nitrogen inputs, promoting permanent cover or more suitable crops, improving pasture management and manure management, or exploring alternative fuel storage options.

Key Action: Find funding partners to provide additional incentives for producers in sensitive areas to engage in the Environment Farm Plan program.

Completion date	Responsibility
2008	**Yorkton Area Aquifers Committee** **City of Yorkton** **Rural Municipalities**

Objective 3:

Establish the Yorkton Area Aquifers Committee, which would be a sub committee of the Assiniboine Advisory Board.

The Assiniboine River Watershed Source Water Protection Plan recommends that a permanent Watershed Manager be assigned to coordinate water management activities in the Assiniboine River Watershed. This Watershed Manager would operate under the oversight of the Assiniboine Advisory Board.

In order to effectively deliver the implementation strategies outlined in the Yorkton Area Aquifers Source Water Protection Plan it is necessary to have a local board or sub-committee to provide local ownership, local impetus to coordinate activities and a central connection among all activities.

Implementation

It is vital that the implementation of the Yorkton Area Aquifers Source Water Protection Plan operates under the premise of local ownership, and that it not be perceived by the local communities as government- or agency-directed. A local Watershed Manager will be able to focus exclusively on local problems and initiatives and be the local "Go-To" contact for all stakeholders.

This structure will unify the efforts of various government and non-government agencies that individually target water, land use and/or development issues. It also provides a forum and a mechanism for all organizations to deliver their respective programs while meeting the overall aquifer planning objectives.

Furthermore, the Yorkton Area Aquifers planning area is too small, both in terms of a geographical area and population base, to independently financially support a permanent Watershed Manager. Thus, partnering within the Assiniboine Advisory Board represents a more viable economic option.

The duties of the local Watershed Manager will include delivering source water protection programs and strategies and promoting Beneficial Management Practices to industry, producers and municipalities.

Recommendation

3.1 All of the participants in the Yorkton Area Aquifers planning process fully support the formation of the Yorkton Area Aquifers Committee.

Key Action: Form a Yorkton Area Aquifers Committee or subcommittee.

Completion date	Responsibility
2006	**Saskatchewan Watershed Authority**

Objective 4:

Increase awareness among watershed residents regarding the effect their activities can have on source water quality and quantity.

By increasing awareness about where aquifers are the most vulnerable to contamination and what activities can potentially affect the quality and quantity of groundwater in the area, people will be better able to carry out their activities in a manner beneficial to source water.

Recommendation

4.1 Provide area residents with educational materials that communicate information such as the general location of aquifers and/or the aquifer's comparative vulnerability to contamination.

- Residents and producers should understand the concept of compatible uses of the land.
- Provide agricultural producers within the area with information on the importance of proper nutrient management. Other residents and industries (for example, golf courses) should also be targeted.

Key Action: Develop an overall communication/education strategy to inform area residents about how the quality and quantity of groundwater can be affected by their activities. This strategy should include guidance from the Saskatchewan Watershed Authority's Policy and Communication division, specifically regarding the implementation of the key actions listed below.

Completion date	Responsibility
2007	**Saskatchewan Watershed Authority**

Key Action: Identify sensitive areas of the Yorkton Area Aquifers with signage. This could include a large map illustrating the aquifers' boundaries and sensitive areas, much like a tourist information billboard.

Completion date	Responsibility
2007 – ongoing	Saskatchewan Watershed Authority

Key Action: Encourage agricultural producers with land in sensitive areas to participate in the Environmental Farm Plan program.

Completion date	Responsibility
2006 – ongoing	Yorkton Area Aquifers Committee

Key Action: Develop guidelines for a formal process to address any well owner concerns arising from the belief that they are being negatively affected by licensed or allocated withdrawals in their area.

Completion date	Responsibility
2007	Saskatchewan Watershed Authority

Key Action: Develop informational fact sheets, pamphlets, and/or brochures about the aquifers. This should include an outline of the process used to allocate groundwater and the complaint process for users that have been affected by licensed withdrawals.

Completion date	Responsibility
2006	Saskatchewan Watershed Authority

Key Action: Publish groundwater monitoring data so that interested individuals can track activity in the aquifer.

Completion date	Responsibility
2006	Saskatchewan Watershed Authority Yorkton Area Aquifers Committee

Key Action: Hold regular field days, tours and demonstration days to provide information on the aquifers and the issues facing them. This programming should, in part, target school groups.

Completion date	Responsibility
2007 – ongoing	Yorkton Area Aquifers Committee

7. Appendices

A. Participants in the Planning Process

B. Aquifier Advisory Committee Terms of Reference

C. Yorkton Area Aquifers Source Water Protection Plan (on CD or at www.swa.ca)

D. Groundwater Resources in the Yorkton Aquifer Management Plan Area Final Report (on CD)

A. Participants in the Planning Process

Yorkton Area Aquifers Advisory Committee Members

Member	Representing
Dale Hackman	Rural Municipality of Orkney No. 244
Brian Handke	Crescent Lake Grazing Cooperative
Dale Heshka	City of Melville
Janet Hill	City of Yorkton
Garry Liebrecht (Alternate: Dale Cherry)	Rural Municipality of Wallace No. 243
Ben Pengilly	Rural Municipality of Cana No. 214
Joe Skitcko	Rural Municipality of Saltcoats No. 213
Gord Tablyn	York Lake Regional Park

Technical Committee Members

Member	Representing
Doug Brook	Ducks Unlimited Canada
Michael Buchholzer	City of Yorkton
Brian Campbell	Saskatchewan Agriculture
Tim Cheesman	Saskatchewan Government Relations
John-Mark Davies	Saskatchewan Watershed Authority
John Fahlman	Saskatchewan Watershed Authority
Jon Gaudry	Sunrise Regional Health Authority
Harm Maathuis	Saskatchewan Research Council
Don Newcombe	Saskatchewan Watershed Authority
Jason Puckett	Saskatchewan Watershed Authority
Joe Zarowny	Saskatchewan Environment

Planning Team

Member	Representing
Brad Ashdown Senior Watershed Analyst	Saskatchewan Watershed Authority
Rob Kirkness Senior Watershed Planner	Saskatchewan Watershed Authority

B. Aquifer Advisory Committee Terms of Reference

Introduction

The new Crown Corporation, the Saskatchewan Watershed Authority, was formed by the Province in an effort to both protect and improve our provincial water resources.

Our focus is the overall health of watersheds and aquifers including their ecosystems. This is a departure from the traditional method of concentrating on specific water issues. The Saskatchewan Watershed Authority feels that the best solutions for potential threats to the aquifers are derived at the local level. Problem-solving that is community-based will develop effective program actions that are able to cross jurisdictional boundaries.

The Watershed Authority is committed to protecting water long before it reaches the tap, via an approach now commonly referred to as "Source Water Protection."

Saskatchewan Watershed Authority Planning Process

Sound aquifer and watershed management has these characteristics:

- proactive;
- accommodating of diverse points of view;
- varies needs and expectations; and
- is conducted at round-table discussions in various community settings.

Significant issues surrounding water management issues and the impact on the ecosystems are understood through these discussions.

Representatives bring expectations and assumptions to the planning process, eventually forming a shared, common understanding amongst partners, working together in good faith, and firmly believing that sound water management and source water protection is everyone's business.

The following is a description of the key elements of the planning process, beginning with the establishment of three committee structures:

- the **Advisory Committee** is to provide local input, guide the process and share in the implementation of outcomes;
- the **Technical Committee** is to collect information and conduct analysis as required; and
- the **Planning Team** is to coordinate the activities, with ultimate responsibility to develop the plan.

The Yorkton Area Aquifers Advisory Committee

This committee has responsibilities to incorporate all of the interests of the residents within the aquifer into the planning process. The Aquifer Advisory Committee is to provide input towards the development of the aquifer plan, become more informed about the relationship between activities and the environment, and share in initiatives to manage the water resources and improve and protect source water. The Committee is also to:

- represent stakeholders and interest groups by identifying and discussing issues that can contribute to a plan for effective source water protection;
- meet on a regular basis and become familiar with up-to-date information provided by the Technical Committee, and share this information with stakeholders where requested; and
- work toward consensus when developing recommendations and key actions intended to address issues identified in the planning process.

The Yorkton Area Aquifers Technical Committee

A key component in the development of the plan is the assembly and analysis of information. A Technical Committee consisting of agency representatives specializing in natural resource management will have this responsibility. This committee will be chaired by the Planning Team, and is to:

- assemble and analyze the pertinent information about the planning area and provide these findings to the Aquifer Advisory Committee;
- communicate with the other members of the Technical Committee to form a better understanding of the planning area and the issues related to source water protection;
- provide assessments of current findings and options to the Aquifer Advisory Committee aimed at addressing the issues that have been identified in the process;
- offer guidance and expertise as required; and
- assist in the preparation of the aquifer management plan.

The Yorkton Area Aquifers Planning Team

The Planning Team guides participants in roundtable discussions to synthesize issues and set priorities. Simply put, planners encourage group validation and commitment to sound water management and source water protection.

The Planning Team will usually consist of two staff from the Watershed and Aquifer Planning branch of the Saskatchewan Watershed Authority. Additional staff from the Saskatchewan Watershed Authority will be integrated into the Planning Team to help guide activities and provide additional insight towards local issues and activities.

The Planning Team is to:

- facilitate meaningful public consultation through a local committee that will communicate issues and concerns identified by the groups they represent;
- coordinate the efforts of a Technical Committee and participate in assembling all available background information about the watershed;
- develop a list of key issues that can be addressed within the means of this planning process, from the findings of the Technical Committee and from matters brought to the fore through public consultation;
- chair, at least initially, Aquifer Advisory Committee meetings;
- develop a plan document that provides recommendations intended to provide source water protection within the plan area using the existing framework of legislation and policies; and
- maintain a balanced representative stakeholder committee so that any one interest does not receive undue recognition.

Role of Others

- Technical experts and personnel from other agencies or interest groups may be asked to attend Aquifer Advisory Committee meetings to provide information on their areas of expertise.
- Observers and members of the public are welcome to attend Aquifer Advisory Committee meetings but will only be able to address the floor after providing notification to the Committee prior to the meeting and having been included on the agenda.
- Alternates are to participate in Aquifer Advisory Committee meetings when the Committee members cannot attend.
- Those who wish to keep informed about the meeting but do not wish to attend may be added to a list of individuals who may receive correspondence in the form of meeting notes or newsletters.

Meeting Structure and Process

- The term of the aquifer planning process is expected to extend at least two (2) years. Members are asked to commit their efforts to the duration of the process.
- Meeting notes will be recorded in summary form.
- The draft agenda for the next meeting will be included with the meeting notes when sent out, generally about two (2) weeks prior to the next meeting.
- If there are to be any changes to the meeting notes, contact the chairperson.
- Revised notes will be handed out at the subsequent meeting.
- Individual names will be attached to comments when requested by the speaker.
- Recommendations for each issue will begin as "draft consensus" items until (all) Aquifer Advisory Committee members have had sufficient time to thoroughly review and consider the item.
- A consensus decision is one that all team members (in attendance) will support or can live with. Consensus does not mean that everyone is totally happy with the decision.
- Final consensus on each recommendation will generally occur at the next scheduled meeting unless the chairperson identifies urgency and determines an action requires precedence.
- Parking lot issues and concerns not in line with current discussion are to be recorded and documented to be discussed at another meeting or later in the agenda. They will be recorded in the meeting notes.
- Meeting evaluations will be done at the end of each meeting.

Code of Conduct

- All committee members are to act in good faith and shall be respectful of differing views, interests and values of others, and expect the same consideration in return.
- Each committee member will be given equal opportunity to share their views and the views of the group they represent with the rest of the committee as long as the topic is relevant to issues being discussed.
- Discussions are to focus on solutions to issues or concerns.
- Members are to maintain diplomacy and refrain from personal attacks.
- Members are to come to meetings prepared by having read background materials or conducted correspondence as requested.

- It is critical that participants are committed to the process. There will be opportunity to send an alternate if needed, so that if two consecutive meetings are missed without a legitimate reason, exclusion from the process may be an outcome. Participants wandering in and out of the process are often disruptive.
- The term of the aquifer planning process is expected to extend at least two (2) years. Members are asked to commit their efforts to the duration of the process.

Representation

Local representation on the Aquifer Advisory Committee:

- Core group of local government representatives (rural and urban municipalities, First Nations).
- Representation from Conservation Area Authorities, Watershed Associations and Irrigation Districts.
- Option at the discretion of the Planning Team with input from the Aquifer Advisory Committee to include other interest groups. Inclusion is based on the premise that the core group does not adequately represent these interests. Part of this decision may be based on an oral or written submission from the interest group for discussion by the Committee.
- An interest group must meet conditions prior to inclusion on the Aquifer Advisory Committee. The group must have a membership basis in the watershed and it must be a registered group (not-for-profit, etc.). The representative must be a resident located within the aquifer planning area.
- Residents at large are not eligible for committee membership. They are represented by local government and have opportunity to provide input during regular open house events and other communication venues.
- It is critical that participants are committed to the process. There will be opportunity to send an alternate if needed, so that if two consecutive meetings are missed without a legitimate reason, exclusion from the process may be an outcome. Participants wandering in and out of the process are often disruptive.

Communication and Media

Media

- All media releases that concern activities of the Aquifer Advisory Committee or the planning process shall be coordinated by the Planning Team.
- Individual interviews with the media shall be restricted to personal opinion or the views of the group being contacted.
- Any dissatisfaction with the process shall be discussed during a committee meeting and shall be given sufficient time to be addressed before being shared with the public.

Communication

- Various communication activities will be determined by the Aquifer Advisory Committee to be used to keep the public informed about the process.
- The progress of the planning process will be updated on a website maintained by the Saskatchewan Watershed Authority at intervals to be determined by the Planning Team.

8. Glossary

Aerobic – living or taking place only in the presence of oxygen.
Allocation – the amount of water assigned for use, out of the total amount that is available for use in a particular watershed or aquifer.
Anaerobic – living or taking place in the absence of oxygen.
Aquatic – consisting of, relating to or being in water; living or growing in, on or near water.
Aquifer – a permeable body of rock capable of yielding usable quantities of groundwater to wells and springs.

Base of groundwater exploration – a feature shown on the provincial groundwater maps. Defines the depth to which it is generally considered to be uneconomic to explore for groundwater because of the depth of drilling required and/or the water at that depth is considered to be too highly mineralized for the intended use.
Bedrock formations – rock deposited prior to glaciation. These layers are overlain by glacial deposits which consist of glacial till, sand and gravel.
Biodiversity (biological diversity) – the many and varied species of life forms on earth, including plants, animals, micro-organisms, the genes they possess and their habitats.

Climate – meteorological elements (e.g. precipitation, temperature, radiation, wind, cloudiness) that characterize the average and extreme conditions of the atmosphere over long periods of time at a location or region of the earth's surface.
Climate change – an alteration in measured meteorological conditions that significantly differs from previous conditions and is seen to endure, bringing about corresponding changes in ecosystems and socio-economic activities.
Conservation – the preservation and renewal, when possible, of human and natural resources. The use, protection and improvement of natural resources according to principles that ensure their highest economic and social benefits.
Conservation easement – a voluntary legal agreement between a property owner and a government or qualified conservation agency. These agreements are tailored to each individual landowner and conserve the property's natural values and features by restricting the type and amount of development that can occur on the owner's property.

Development – building, engineering, mining or other operations that alter or intensify the use of a resource.
Deleterious substance – any substance that is deleterious to fish, fish habitat, or to the use by man of fish that frequent that water. See *The Fisheries Act* for further details.
Discharge – the flow of surface water in a stream or ditch or the flow of groundwater from a spring or flowing artesian well; the rate of flow.
Diversion – the removal of water from any waterbody, watercourse or aquifer (either for use or storage), including the removal of water for drainage purposes. Construction of any works required for the diversion of water need approval pursuant to Section 50 of The *Saskatchewan Watershed Authority Act*. The total diversion is equal to the allocation plus any losses from evaporation or seepage.

Drainage – movement of water off land, either naturally or man-made.
Drought – generally in reference to periods of less than average or normal precipitation over a set time, sufficiently prolonged to cause serious hydrological imbalance that results in biological or economic losses.
DUC – Ducks Unlimited Canada, an entity that conserves, restores and manages wetlands and associated habitat for North American waterfowl. These habitats also benefit other wildlife and people.

Ecological – pertains to the relationship between living organisms and their environments.
Economic development – the process of using and converting resources into wealth, jobs and an enhanced quality of life.
Ecosystem – a dynamic complex of organisms (biota) including humans, and their physical environment, that interacts as a functional unit in nature.
Effective drainage area – the area which is estimated to contribute runoff in at least half of the years.
Effluent – the treate wastewater discharged into the environment.

Facultative – bacteria that can live in a range of external conditions, including both aerobic and anaerobic conditions.
First Nation – an Indian band or an Indian community functioning as a band but not having official band status, not including Inuit or Métis peoples.

Grazing management – activities that ensure stocking rates are appropriate to sustain long-term health of livestock grazing conditions during wet and dry seasons.
Gross drainage area – the area bounded by the height of land between adjacent watersheds.
Groundwater – water beneath the surface of the earth in the pores and fractures of sand, gravel, and rock formations.

Habitat – natural surroundings or native environment where a plant or animal grows and lives.
Headwater – small streams and lakes that are the sources of a river, located in the upper reaches of a watershed.
Hydro – from the Greek hydor, meaning "water."
Hydrogeology – the science of subsurface waters and related geologic aspects.
Hydrology – the science of the waters of the earth, their occurrences, circulation and distribution on or below the earth's surface.

Intensive Livestock Operation (ILO) – production facilities such as feedlots and buildings where many animals are raised in a confined space that does not have naturally-growing vegetation and where waste accumulates if not removed (as defined by *The Agricultural Operations Act* in Saskatchewan).

Land cover – predominant vegetation on the surface of a parcel of land.
Land use – present use of a given area of land.
Leachate – a liquid that has percolated through or out of another substance such as soil or refuse, and may contain nutrients or contaminants.
Lithology – the characteristics of rock formations.

Median – a value in a sorted range of values by which there is the same number of values above it as there is below it. A statistical term used in non-parametric statistics.

Native prairie – age-old plant communities of the prairie and parkland regions that may contain more than 200 types of grasses, flowers and shrubs (native grassland and parkland aquatic and terrestrial habitats).
Non-point source pollution – single or multiple contaminants of unknown origin that enter waterways, degrading water quality.

Partnership – co-operative, collaborative alliance between/among stakeholders in a non-legal arrangement used to improve and build relationships and achieve common goals.
Permeability – the ability of a material to allow the passage of a liquid, such as water through rocks. Permeable materials, such as gravel and sand, allow water to move quickly through them, whereas impermeable material, such as clay, does not allow water to flow freely.
Point source contamination – a static and easily identifiable source of air, soil or water pollution.

Recharge – replenishment of the groundwater by the addition of water.
Riparian – an area of land adjacent to or connected with a stream, river, lake or wetland that contains vegetation that is distinctly different from vegetation of adjacent upland areas.
Riparian areas – the zone of vegetation alongside waterways and other surface water. Lush and diverse vegetation is the best sign of healthy, well-managed riparian areas and is critical to filtering and slowing runoff.
River basin – an area that contributes to form a watershed.

Sewage – the waste and wastewater from residential or commercial establishments that is normally discharged into sewers.
Sewage lagoon – a shallow pond where sunlight, bacterial action and oxygen work to purify wastewater; also used for storage of wastewater.
Source water protection – the prevention of pollution and the sound management of factors and activities that (may) threaten water quality and quantity of lakes, reservoirs, rivers, streams and groundwater.
Stakeholder – individual or group with direct or indirect interest in issues or situations, usually involved in understanding and helping resolve or improve their situations.
Stewardship – judicious care and responsibility by individuals or institutions for reducing their impacts on the natural environment.

Water quality – the chemical, physical and biological characteristics of water with respect to its suitability for a specific use.
Watershed – an elevated boundary contained by its drainage divide and subject to surface and subsurface drainage under gravity to the ocean or interior lakes.
Watershed health – the desired maintenance over time of biological diversity, biotic integrity and ecological processes of a watershed.
Watershed and aquifer management – a process, within the geographic confines of a watershed or aquifer, that facilitates planning, directing, monitoring and evaluating activities to ensure sustainable, reliable, safe and clean water supplies.

Watershed and aquifer planning – a process, within the geographic confines of a watershed or aquifer and with the participation of stakeholders, to develop plans to manage and protect water resources.

Wetland – an area of low-lying land covered by water often enough to support aquatic plants and wildlife for part of the life cycle. The wetland area includes the wet basin and adjacent upland.

9. Reference List

Ehle, M., K.J. Lim, B.A. Engel, Y. Kim, B. Bhaduri, and J. Harbor. *WWW System to Evaluate the Effects of Land Use Change on Hydrology and Water Quality.* San Diego, CA: ESRI, 1999.

Maathuis, Harm and Mark Simpson. *Groundwater Resources in the Yorkton Aquifer Management Plan Area Final Report.* Saskatoon, SK: Environment and Minerals Division, Saskatchewan Research Council, 2006.

Schaefer, K. A. and A.T. Bielak, 2005. *CCME Linking Water Science to Policy Workshops. Final Report: An Overview and Lessons Learned.* Canadian Council of Ministers of the Environment, Winnipeg, Manitoba. CCME Linking Water Science to Policy Workshop Series. Report No. 7. 22 p.